

10. (Amended) The method of Claim 1 wherein the linear isocyanate-terminated polyurethane prepolymer is prepared by reacting an organic diisocyanate monomer with a polyol, in a mole ratio of organic diisocyanate monomer to polyol ranging from about 1.7:1 to about 12:1.

REMARKS

In response to the Office Action of July 30, 2002, Applicants have amended the claims, which when considered with the following remarks, is deemed to place the present application in condition for allowance. Favorable reconsideration of all pending claims is respectfully requested. Amendments have been made in the interest of expediting prosecution of this case.

Claims 1-16 are pending in this application. By this Amendment, Claims 1, 5, 7, 8 and 10 have been amended. Applicants have attached herein Appendix A containing a marked-up version of original Claims 1, 5, 7, 8 and 10. Applicants respectfully submit that no new matter has been added to the subject application nor have any new issues been raised by this amendment. Thus, entry and reconsideration of this application is deemed proper as it places the claims in condition for immediate allowance or to simplify issues on appeal, if one is necessary.

The Examiner has rejected Claims 1-16 under the first paragraph of 35 U.S.C. §112 as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, the Examiner alleges that applicants have failed to clearly define exactly what is meant by the recitation "substantially linear

isocyanate-terminated polyurethane prepolymer.” Although not necessarily agreeing with the Examiner, Applicants have amended Claims 1, 5, 7, 8 and 10 to recite “linear isocyanate-terminated polyurethane prepolymer” to expedite prosecution of this case thus obviating this rejection. Accordingly, withdrawal of the rejection under the first paragraph of 35 U.S.C. §112 is warranted and such is respectfully requested.

The Examiner has rejected Claims 1-16 under the second paragraph of 35 U.S.C. §112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Specifically, the Examiner alleges that it is unclear how “substantially” modifies “linear”. Although, not necessarily agreeing with the Examiner, Applicants have amended Claims 1, 5, 7, 8 and 10 to recite “linear isocyanate-terminated polyurethane prepolymer” to expedite prosecution of this case.

The Examiner also alleges that the use of the term “about” within the language “less than about 250” renders the claim indefinite because the term “about” encompasses values slightly above 250 and therefore it is unclear if the express “less than about 250” actually encompasses values of 250 or slightly above.

In ascertaining whether claims comply with the second paragraph of section 112, a determination is made as to whether the claims set out and circumscribe a particular area with a reasonable degree of precision and particularity. *In re Moore*, 39 F.2d 1232, 169 USPQ 236 (CCPA 1971). The claims should not be considered in a vacuum, “but always in light of the teachings of the prior art and of the particular application disclosure as it would be interpreted by one possessing ordinary skill in the art.” *Id.* It is submitted that the term “about”, although

relative, is not indefinite. Applicants further submit that the term "about" as it appears in Claim 1 and in the specification, would be interpreted by one possessing ordinary skill in the art as having the ordinary dictionary meaning, i.e., a diol having a molecular weight below 250 and slightly above 250. As such, it is respectfully submitted that Claims 1-16 set out and circumscribe a particular area with a reasonable degree of precision and particularity. Accordingly, withdrawal of the rejection under the second paragraph of 35 U.S.C. §112 is respectfully requested.

The Examiner has maintained the rejection of Claims 1-16 under 35 U.S.C. §103(a) as being obvious over Okazaki et al. U.S. Patent No. 3,899,623 ("Okazaki") or Koyama et al. U.S. Patent No. 5,436,399 ("Koyama") in view of Gajewski U.S. Patent No. 5,895,689 ("Gajewski '689") or Gajewski U.S. Patent No. 5,895,806 ("Gajewski '806") or Ruprecht et al., "Roll Covering by Rotational Casting with Fast-Reacting PUR Systems", Polyurethanes World Congress 1991 (Sep. 24-26) pp. 478-481 ("Ruprecht"). This rejection is respectfully traversed.

As pointed out by the Examiner, nowhere does Okazaki or Koyama disclose or suggest a method for coating a flexible substrate employing the step of "rotationally casting to the substrate a coating comprising a polyurethane composition formed from (a) a linear isocyanate-terminated polyurethane prepolymer; and, (b) a curative agent containing a diol having a molecular weight of less than about 250" as presently recited in amended Claim 1.

Rather, both Okazaki and Koyama disclose coating an impregnated sheet or other fibrous material using a polyurethane coating composition formed from substantially linear isocyanate-terminated prepolymer and a diol chain extender, e.g., 1,4-butane diol. However, there is no disclosure of any coating method in both Okazaki and Koyama.

Gajewski '689, Gajewski '806, Kulp and Ruprecht each fail to cure the deficiencies of Okazaki and Koyama. Specifically, Gajewski '689, Gajewski '806, Kulp and Ruprecht likewise fail to disclose or suggest a method for coating a flexible substrate employing the step of rotationally casting to the flexible substrate a polyurethane coating composition formed from (a) a linear isocyanate terminated polyurethane prepolymer and (b) a curative agent containing a diol having a molecular weight of less than about 250 to provide coated flexible substrates having high flex fatigue properties.

Rather, Gajewski '689 and Gajewski '806 disclose a rotational casting method for coating cylindrical objects, i.e., a rigid substrate, employing a polyurethane composition obtained from an isocyanate-terminated polyurethane prepolymer and a curative mixture containing a polyol curative agent, e.g., polytetramethylene ether glycol, a diol having a high molecular weight such as 650 (see Example 2) and a blend of thixotropic agents. Kulp likewise discloses a rotational casting method for coating cylindrical objects useful as rollers and wheels employing a polyurethane elastomer composition formed from an isocyanate-terminated polyurethane prepolymer and amine curative agent containing an aminobenzoate functionalized polyol having a weight average molecular weight of 200 to 3,000. Ruprecht also likewise discloses a rotational casting method for cylindrical objects, e.g., roll coverings, using a fast-reacting polyurethane elastomer formed from an isocyanate-terminated polyurethane prepolymer and a curative mixtures containing long-chained polyether polyols and short-chained extenders. At no point however is there any disclose, suggestion or even a hint in any of the secondary references of coating a flexible substrate by rotationally a polyurethane composition formed from a linear isocyanate-

terminated polyurethane prepolymer and a curative agent containing a diol having a molecular weight less than about 250 to impart improved flex fatigue properties.

The Examiner alleges that it would have been obvious from the teaching of the secondary references to select a rotational casting process from the known field of polyurethane casting techniques, so as to arrive at the claimed method. The Examiner further alleges that since it has long been known that cure or reaction profiles of polyurethanes can be controlled based on the reactivity of the chain extender, the position is taken that it would have been obvious to tailor reaction profiles, depending on the requirements of the rotational casting process, by using blends of curative agents, including the disclosed diols and secondary amines, so as to arrive at the instant invention. This wholly unsupported statement cannot possibly serve as a basis for this rejection. If it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to tailor reaction profiles, depending on the requirements of the rotational casting process, since it has long been known that cure or reaction profiles of polyurethanes can be controlled based on the reactivity of the chain extender, the Examiner is respectfully requested to identify with particularity where such teaching can be found. Certainly, none of the primary references or secondary references provides such teaching or suggestion.

Besides, as shown from the examples in Applicants' specification, when comparing Applicants' Examples 4-8 employing the specifically recited polyurethane composition containing a linear isocyanate-terminated polyurethane prepolymer and a diol curative agent having a molecular weight below about 250 in the claimed process (within the scope of the invention) with

Comparative Examples E-I employing an isocyanate-terminated polyurethane prepolymer and a diol curative agent having a molecular weight greater than 250 in the otherwise same process (outside the scope of the invention), the polyurethane compositions outside the scope of the invention provided significantly lower flex fatigue values than the polyurethane compositions employed in Examples 4-8. The results of this data is reproduced below for the Examiner's convenience:

<u>SAMPLE</u>	<u>STOICHIOMETRY</u>	<u>CURE TEMP. (°C)</u>	<u>SHORE A</u>	<u>TEXUS FLEX. CYCLES</u>
Example 4	98	115	85	800K
Example 5	98	room temp.	86	220K
Example 6	95	70	90	25K
Example 7	103	70	89	103K
Example 8	98	115	90	12K
Comp. Ex. E	95	70	90	3K
Comp. Ex. F	100	70	89	6K
Comp. Ex. G	105	70	88	40K

As these data show, when employing a linear isocyanate-terminated polyurethane prepolymer and 1,4-butane diol, i.e., a diol curative agent having a molecular weight less than 250 (within the scope of this invention) of Examples 4-8, resulted in a significantly higher flex fatigue value as compared to a polyurethane composition employing a branched isocyanate-terminated polyether prepolymer and PTMEG, i.e., a curative agent having a high molecular weight (outside the scope of this invention) of Comparative Examples E-G. For example, when

comparing Example 7 with Comparative Example G, both of which utilized relatively similar stoichiometric amounts of prepolymer and curative agent, the polyurethane composition of Example 7 showed a significantly higher flex fatigue value, i.e., 103K vs. 40K. The same holds true when comparing Examples 6 and 8 with Comparative Examples E and F, respectively.

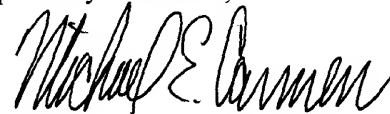
It is also important to note that when rotationally casting the polyurethane compositions of Comparative Example H, which employed the same linear isocyanate-terminated polyurethane prepolymer as in Examples 4 and 5, and Comparative Example I, which employed the same linear isocyanate-terminated polyurethane prepolymer as in Examples 6-8, but both of which employed polytetramethylene ether glycol (PTMEG) a high molecular weight diol as the curative agent, the resulting films provided flex fatigue values that were not measurable, i.e., the resulting film was too soft and therefore inoperable. Nothing in Gajewski '689, Gajewski '806, Kulp or Ruprecht would lead one skilled in the art to look to the disclosures of Gajewski '689, Gajewski '806, Kulp or Ruprecht to modify the disclosures of Okazaki or Koyama to arrive at the presently claimed process. Nothing in Gajewski '689, Gajewski '806, Kulp or Ruprecht leads to the use of the recited polyurethane composition to achieve high flex fatigue properties. Nothing in Gajewski '689, Gajewski '806, Kulp or Ruprecht leads to the use of polyurethane compositions containing a linear isocyanate-terminated polyurethane prepolymer and a diol curative agent having a molecular weight less than about 250 for use in rotationally casting on flexible substrates.

For the foregoing reasons, since Okazaki or Koyama, alone or in combination with Gajewski '689, Gajewski '806, Kulp or Ruprecht, do not disclose or suggest a method for coating a flexible substrate employing the step of rotationally casting to the flexible substrate a

polyurethane coating composition formed from (a) a linear isocyanate terminated polyurethane prepolymer and (b) a curative agent containing a diol having a molecular weight of less than about 250" as presently recited in amended Claim 1, amended Claims 1-16 are believed to be nonobvious, and therefore patentable, over Okazaki, Koyama, Gajewski '689, Gajewski '806, Kulp and Ruprecht.

For the foregoing reasons, it is submitted that amended Claims 1-16 as presented herein are in condition for immediate allowance. Such early and favorable action is earnestly solicited.

Respectfully submitted,



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APPENDIX A

1. (Amended) A method for coating a flexible substrate which comprises rotationally casting to the substrate a coating comprising a polyurethane composition formed from (a) a [substantially] linear isocyanate-terminated polyurethane prepolymer; and, (b) a curative agent containing a diol having a molecular weight of less than about 250 and, optionally, a secondary aliphatic diamine, [wherein the polyurethane composition is formed in the absence of a non-linear isocyanate-terminated polyurethane prepolymer].

5. (Amended) The method of Claim 1 wherein the [substantially] linear isocyanate-terminated polyurethane prepolymer is a reaction product of a polyol and an organic diisocyanate monomer selected from the group consisting of 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 4,4'-diisocyanatodiphenylmethane (MDI), phenylenediisocyanate (PPDI), diphenyl-4,4'-diisocyanate, 1,3-xylene diisocyanate, 1,4-xylene diisocyanate, 1,6-hexamethylene diisocyanate, 1,3-cyclohexyl diisocyanate, 1,4-cyclohexyl diisocyanate (CHDI), diphenylmethane diisocyanate (H(12)MDI) and isophorone diisocyanate.

7. (Twice Amended) The method of Claim 1 wherein the [substantially] linear isocyanate-terminated polyurethane prepolymer is a reaction product of an organic diisocyanate monomer and a polyol selected from the group consisting of ethylene glycol, diethylene glycol, 1,2-propylene glycol, 1,3-propane diol, 1,4-butylene glycol, polytetramethylene ether glycol (PTMEG), polycarbonate and a dihydroxy polyester.

8. (Amended) The method of Claim 1 wherein the [substantially] linear isocyanate-terminated polyurethane prepolymer is a reaction product of an organic diisocyanate monomer and a dihydroxypolyester.

10. (Amended) The method of Claim 1 wherein the [substantially] linear isocyanate-terminated polyurethane prepolymer is prepared by reacting an organic diisocyanate monomer with a polyol, in a mole ratio of organic diisocyanate monomer to polyol ranging from about 1.7:1 to about 12:1.